IN THE CLAIMS

Please replace any previous listing of the claims with the following replacement listing of the claims:

Replacement Listing of the Claims

1. (Previously presented) An active noise and vibration control system for generating an antinoise signal to attenuate a narrowband noise signal propagating through a medium, said active noise and vibration control system performing on-line noninvasive secondary path modeling, said system, comprising:

a reference sensor operable to receive a reference signal related to a primary noise and to generate a primary signal in response;

a secondary source operable to generate an antinoise corresponding to a secondary signal that attenuates the primary noise;

an error sensor operable to receive a residual signal that is a superposition of said primary noise and a secondary noise at the location of said error sensor, and to generate an error signal in response thereto; and

a controller operable to receive said primary signal and said error signal and to generate said secondary signal while performing on-line noninvasive secondary path modeling, said controller comprising an on-line noninvasive secondary path modeler operable to receive said primary signal, said secondary signal, and said error signal for the purpose of calculating a secondary path model, wherein said online noninvasive secondary path modeler captures first and second data sets comprising said reference signal, said error signal and said generated secondary signal, to calculate a transfer function of a secondary path, and to alter an output of said secondary source by adjusting output filter coefficients of a control filter in amplitude, in phase, or in both amplitude and phase between acquisition of said first and second data sets, thereby imposing linear independence on said first and second data sets, wherein said secondary path modeler uses said control filter and said first and second data sets to calculate said secondary path

model algebraically in a system of first and second equations-two unknowns, P(k) and S(k) as follows:

$$X_A(k)P(k)+Y_A(k)S(k)=E_A(k)$$
$$X_B(k)P(k)+Y_B(k)S(k)=E_B(k),$$

where $\{X_A(k),Y_A(k),E_A(k)\}$ corresponds to said first data set and $\{X_B(k),Y_B(k),E_B(k)\}$ corresponds to said second data set, $Y_A(k)$ and $Y_B(k)$ represent outputs of said control filter according to the equations

$$Y_A(k)=W_A(k)X_A(k)$$
$$Y_B(k)=W_B(k)X_B(k)$$

where $W(k)$ is the FFT of said control filter's impulse response, wherein said linear independence of said first and second equations is achieved by ensuring the inequality of $W_A(k)\neq W_B(k)$, wherein a solution of said first and second equations is given by:

$$\hat{P}(k)=\frac{E_A(k)Y_B(k)-Y_A(k)E_B(k)}{X_A(k)Y_B(k)-Y_A(k)X_B(k)},$$

$$\hat{S}(k)=\frac{X_A(k)E_B(k)-E_A(k)X_B(k)}{X_A(k)Y_B(k)-Y_A(k)X_B(k)}, \text{ and}$$

wherein an equation derived from said algebraic calculation is modified to account for spectral leakage and narrowband effects.

2 -4. (Canceled)

5. (Previously presented) The system according to claim 1, wherein said derived equation is modified to account for multiple frequency signals, and frequency spectrum is divided into subbands to scale each frequency component separately.

6. (Currently amended) A feedforward active noise and vibration control system, comprising:

a controller for receiving a primary signal and an error signal and generating a secondary signal in response thereto, said controller comprising: an adaptive filter utilizing block time-domain or equivalent frequency-domain processing, an on-line

noninvasive secondary path modeler that captures first and second data sets comprising a reference signal, an error signal and generates said secondary signal, to calculate a transfer function of said secondary path, and to alter an output of a secondary source by adjusting output filter coefficients of said adaptive filter in amplitude, in phase, or in both amplitude and phase between acquisition of said first and second data sets, thereby imposing linear independence on said first and second data sets; wherein said secondary path modeler uses first and second data sets to calculate a secondary path model algebraically in a system of ~~two~~ first and second equations-two unknowns, P(k) and S(k) as follows:

$$X_A(k)P(k)+Y_A(k)S(k)=E_A(k)$$
$$X_B(k)P(k)+Y_B(k)S(k)=E_B(k),$$

where $\{X_A(k),Y_A(k),E_A(k)\}$ corresponds to said first data set and $\{X_B(k),Y_B(k),E_B(k)\}$ corresponds to said second data set, $Y_A(k)$ and $Y_B(k)$ represent outputs of said control filter according to the equations

$$Y_A(k)=W_A(k)X_A(k)$$
$$Y_B(k)=W_B(k)X_B(k)$$

where $W(k)$ is the FFT of said control filter's impulse response, wherein said linear independence of said first and second equations is achieved by ensuring the inequality of $W_A(k)\neq W_B(k)$, wherein a solution of said first and second equations is given by:

$$\hat{P}(k)=\frac{E_A(k)Y_B(k)-Y_A(k)E_B(k)}{X_A(k)Y_B(k)-Y_A(k)X_B(k)},$$

$$\hat{S}(k)=\frac{X_A(k)E_B(k)-E_A(k)X_B(k)}{X_A(k)Y_B(k)-Y_A(k)X_B(k)}, \text{ and}$$

wherein an equation derived from said algebraic calculation is modified to account for spectral leakage and narrowband effects.

7. (Original) The system according to claim 6, further comprising:

an online noninvasive secondary path modeler to capture two data sets comprising a reference signal, an error signal and generated secondary signal, to calculate a transfer function of said secondary path, and to alter an output of a secondary source by adjusting

output filter coefficients in amplitude, in phase, or in both amplitude and phase between acquisition of said data sets, thereby imposing linear independence on said data sets.

8 and 9. (Canceled)

10. (Currently amended) A method for calculating an accurate secondary path model, comprising:

employing an on-line noninvasive secondary path modeler to capture first and second data sets comprising a reference signal, an error signal and a generated secondary signal;

using said on-line noninvasive secondary path modeler to calculate the transfer function of a secondary path; and

using said on-line noninvasive secondary path modeler to alter an output of a secondary source by adjusting output filter coefficients of a control filter in amplitude, in phase, or in both amplitude and phase between acquisition of said first and second data sets, thereby imposing linear independence on said first and second data sets, wherein said secondary path modeler uses said control filter <u>and</u> said first and second data sets to calculate said secondary path model algebraically in a system of first and second equations-two unknowns, P(k) and S(k) as follows:

$$X_A(k)P(k)+Y_A(k)S(k)=E_A(k)$$
$$X_B(k)P(k)+Y_B(k)S(k)=E_B(k),$$

where $\{X_A(k),Y_A(k),E_A(k)\}$ corresponds to said first data set and $\{X_B(k),Y_B(k),E_B(k)\}$ corresponds to said second data set, $Y_A(k)$ and $Y_B(k)$ represent outputs of said control filter according to the equations

$$Y_A(k)=W_A(k)X_A(k)$$
$$Y_B(k)=W_B(k)X_B(k)$$

where $W(k)$ is the FFT of said control filter's impulse response, wherein said linear independence of said first and second equations is achieved by ensuring the inequality of $W_A(k)\neq W_B(k)$, wherein a solution of said first and second equations is given by:

$$\hat{P}(k)=\frac{E_A(k)Y_B(k)-Y_A(k)E_B(k)}{X_A(k)Y_B(k)-Y_A(k)X_B(k)},$$

$$\hat{S}(k)=\frac{X_A(k)E_B(k)-E_A(k)X_B(k)}{X_A(k)Y_B(k)-Y_A(k)X_B(k)}, \text{ and}$$

wherein an equation derived from said algebraic calculation is modified to account for spectral leakage and narrowband effects.

11. (Original) The method according to claim 10, wherein said secondary path modeler is noninvasive.

12 and 13. (Canceled)

14. (Previously presented) The method according to claim 10, wherein said derived equation is modified to account for multiple frequency signals, and frequency spectrum is divided into subbands to scale each frequency component separately.

15-20. (Canceled)

21. (Currently amended) A method for on-line noninvasive secondary path modeling, comprising:

receiving, by a reference sensor, a reference signal related to a primary noise;

generating, by said reference sensor, a primary signal in response to said reference signal;

generating, by a secondary source, an antinoise corresponding to a secondary signal that attenuates the primary noise;

receiving, by an error sensor, a residual signal that is the superposition of said primary noise and a secondary noise at the location of said error sensor, and to generate an error signal in response thereto; and

receiving, by a controller, said primary signal and said error signal;

generating, by said controller, said secondary signal while performing on-line noninvasive secondary path modeling, said controller comprising an on-line noninvasive

secondary path modeler operable to receive said primary signal, said secondary signal, and said error signal for the purpose of calculating a secondary path model, wherein said online noninvasive secondary path modeler captures first and second data sets comprising said reference signal, said error signal and said generated secondary signal, to calculate a transfer function of a secondary path, and to alter an output of said secondary source by adjusting output filter coefficients of a control filter in amplitude, in phase, or in both amplitude and phase between acquisition of said first and second data sets, thereby imposing linear independence on said first and second data sets, wherein said secondary path modeler uses said control filter and said first and second data sets to calculate said secondary path model algebraically in a system of first and second equations-two unknowns, P(k) and S(k) as follows:

$$X_A(k)P(k) + Y_A(k)S(k) = E_A(k)$$
$$X_B(k)P(k) + Y_B(k)S(k) = E_B(k),$$

where $\{X_A(k), Y_A(k), E_A(k)\}$ corresponds to said first data set and $\{X_B(k), Y_B(k), E_B(k)\}$ corresponds to said second data set, $Y_A(k)$ and $Y_B(k)$ represent outputs of said control filter according to the equations

$$Y_A(k) = W_A(k)X_A(k)$$
$$Y_B(k) = W_B(k)X_B(k)$$

where $W(k)$ is the FFT of said control filter's impulse response, wherein said linear independence of said first and second equations is achieved by ensuring the inequality of $W_A(k) \neq W_B(k)$, wherein a solution of said first and second equations is given by:

$$\hat{P}(k) = \frac{E_A(k)Y_B(k) - Y_A(k)E_B(k)}{X_A(k)Y_B(k) - Y_A(k)X_B(k)},$$

$$\hat{S}(k) = \frac{X_A(k)E_B(k) - E_A(k)X_B(k)}{X_A(k)Y_B(k) - Y_A(k)X_B(k)}, \text{ and}$$

wherein an equation derived from said algebraic calculation is modified to account for spectral leakage and narrowband effects.

22. (Previously presented) A method for feedforward active noise and vibration control, comprising:

receiving, by a controller, a primary signal and an error signal and generating a secondary signal in response thereto, said controller comprising: an adaptive filter utilizing block time-domain or equivalent frequency-domain processing, an on-line noninvasive secondary path modeler that captures first and second data sets comprising a reference signal, an error signal and generates said secondary signal, to calculate a transfer function of said secondary path, and to alter an output of a secondary source by adjusting output filter coefficients of said adaptive filter in amplitude, in phase, or in both amplitude and phase between acquisition of said first and second data sets, thereby imposing linear independence on said first and second data sets; wherein said secondary path modeler uses said adaptive filter and said first and second data sets to calculate a secondary path model algebraically in a system of first and second equations-two unknowns, P(k) and S(k) as follows:

$$X_A(k)P(k)+Y_A(k)S(k)=E_A(k)$$
$$X_B(k)P(k)+Y_B(k)S(k)=E_B(k),$$

where $\{X_A(k),Y_A(k),E_A(k)\}$ corresponds to said first data set and $\{X_B(k),Y_B(k),E_B(k)\}$ corresponds to said second data set, $Y_A(k)$ and $Y_B(k)$ represent outputs of said control filter according to the equations

$$Y_A(k)=W_A(k)X_A(k)$$
$$Y_B(k)=W_B(k)X_B(k)$$

where $W(k)$ is the FFT of said control filter's impulse response, wherein said linear independence of said first and second equations is achieved by ensuring the inequality of $W_A(k)\neq W_B(k)$, wherein a solution of said first and second equations is given by:

$$\hat{P}(k)=\frac{E_A(k)Y_B(k)-Y_A(k)E_B(k)}{X_A(k)Y_B(k)-Y_A(k)X_B(k)},$$

$$\hat{S}(k)=\frac{X_A(k)E_B(k)-E_A(k)X_B(k)}{X_A(k)Y_B(k)-Y_A(k)X_B(k)}, \text{ and}$$

wherein an equation derived from said algebraic calculation is modified to account for spectral leakage and narrowband effects.